Job No 24590

Bechtel National, Inc.

SUPPLIER DOCUMENT STATUS

1. [X] **Work may proceed.**
2. [ ] **Revise and resubmit. Work may proceed subject to resolution of indicated comments.**
3. [ ] **Revise and resubmit. Work may not proceed.**
4. [ ] **Review not required. Work may proceed.**

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

REVIEWED EGS 5/12

G-321 Document Category N/A
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev. _____
[When applicable]

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[When applicable]

416 GP&S 7-03

24590-CM-HC4-HXYG-00138-02-00030

REV. 00A

SUBCONTRACT SUBMITTAL

IQRPE REVIEW –
HIGH LEVEL WASTE (HLW) FACILITY ELEVATION 0'-0" HLW MELTER FEED (HFP) SYSTEM ANCILLARY EQUIPMENT

"I, Douglas W. Hendrickson, have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the High Level Waste (HLW) Facility Elevation 0'-0" HLW Melter Feed (HFP) System Ancillary Equipment as required by the Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicate that the design intent fully satisfies the requirements of the WAC.

The attached review is ten (10) pages numbered one (1) through ten (10).

Signature

13 May 2004
Date

24590-CM-HC4-HXYG-00138-02-00030, REV. 00A

STRUCTURAL INTEGRITY ASSESSMENT OF THE HIGH LEVEL WASTE (HLW) FACILITY ELEVATION 0'-0" HLW MELTER FEED (HFP) SYSTEM ANCILLARY EQUIPMENT

COGEMA-IA-051
REV. 1

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Scope	Scope of this Integrity Assessment	This integrity assessment includes: a. Ancillary equipment associated with the HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00001 as shown on drawing 24590-HLW-M6-HFP-P0001, Rev. 0 b. Ancillary equipment associated with the HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00002 as shown on drawing 24590-HLW-M6-HFP-P0002, Rev. 0 c. Ancillary equipment associated with the HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00005 (Melter 2) as shown on drawing 24590-HLW-M6-HFP-P20001, Rev. 0 d. Ancillary equipment associated with the HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00006 (Melter 2) as shown on drawing 24590-HLW-M6-HFP-P20002, Rev. 0
References	Drawings and System Description	24590-HLW-3YD-HFP-00001, Rev. 0, System Description for HLW Melter Feed (System HFP); System Description Change Notices (SDCNs) Nos. 24590-HLW-3YN-HFP-00001 and 24590-HLW-3YN-HFP-00002 for System Description Number 24590-HLW-3YD-HFP-00001, Rev. 0; 24590-HLW-M5-V17T-P0001, Rev. 2, Process Flow Diagram HLW Receipt & Feed Preparations (System HCP, GFR, & HFP); 24590-HLW-M6-HFP-P0001, Rev. 0, P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00001 (Q); 24590-HLW-M6-HFP-P0002, Rev. 0, P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00002 (Q); 24590-HLW-M6-HFP-P20001, Rev. 0, P&ID – HLW Melter Feed Process System Melter Feed Preparation Vessel HFP-VSL-00005 (Melter 2) (Q); 24590-HLW-M6-HFP-P20002, Rev. 0, P&ID – HLW Melter Feed Process System Melter Feed Vessel HFP-VSL-00006 (Melter 2) (Q)

Summary of Assessment For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to assure the design intent fully satisfies the WAC requirements.

Design	Ancillary equipment design standards are appropriate and adequate for the equipment's intended use.	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PSAR-ESH-01-002-04, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; HLW Facility Specific Information	The Pipe Stress Design Criteria document identifies ASME B31.3 as the design code for piping systems of the WTP. Seismic Categories and Quality Levels vary among the ancillary equipment components. For example, the radar guide tube shown on P&ID drawing no. 24590-HLW-M6-HFP-P0001 is Seismic Category (SC-1) and Quality Level (QL-1) to ensure continued function during normal operations, abnormal operations, and during and after a Design Basis Earthquake. Much of the ancillary equipment is Seismic Category (SC-II) and Quality Level (QL-2) as noted for example on P&ID drawing no. 24590-HLW-M6-HFP-P0001. Hydrogen mitigation portions of the ancillary equipment are SDC and will be SC-I and QL-1, including the vessel vent line and overflow line. The Seismic Categories are explained in detail in the Pipe Stress Design Criteria document. Quality Levels are discussed in the PSAR. These codes and standards are acceptable and adequate for the design of the ancillary equipment for the intended service.
	If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction.	24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"	The ancillary equipment is built to design standards. The Pipe Stress Design Criteria document specifies that piping is to be designed in accordance with ASME B31.3.

Design	Ancillary equipment has adequate strength at the end of its design life to withstand the operating pressure, operating temperature, thermal expansion, and seismic loads. Equipment is protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.	24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; Uniform Building Code (UBC), 1997 Edition, International Conference of Building Officials; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NC, Appendix N and Appendix F, 1995; 24590-WTP-VV-PS-01-001, Rev. 2, Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8	The Pipe Stress Design Criteria document requires the use of the ASME B31.3 Code for piping design. ASME B31.3 requires explicit consideration of many loadings including operating pressure, operating temperature, thermal expansion/contraction, settlement, vibration, and corrosion allowance in the design of piping. Elements of the ASME B&PV Code, Section III, Division 1, Subsection NC, Appendix N and Appendix F are used to supplement the requirements of ASME B31.3 for seismic design of SC-I/SC-II piping. Although applicable elsewhere, ASME B&PV Code, Section III, Division 1, Subsection NC and Appendix F, and the Uniform Building Code (UBC) are not used to supplement the requirements of ASME B31.3 for seismic design of SC-III/SC-IV piping for this ancillary equipment as none is SC-III/SC-IV. Details of the seismic design methods are discussed in the Pipe Stress Design Criteria document. Design is by hand calculations and computer codes that have been tested and approved as discussed in the Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8. These are adequate and appropriate codes and standards to ensure that the ancillary equipment will have adequate strength at end of design life to withstand all anticipated loadings.

Supports	Ancillary equipment supports are adequately designed.	Drawings - see references above; 24590-WTP-DC-PS-01-002, Rev 2, Pipe Support Design Criteria; 24590-WTP-PER-PS-02-001, Rev. 4, Ancillary Equipment Pipe Support Design; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NF and Appendix F, 1995; 24590-WTP-PL-PS-01-001, Rev 1, Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS)	The Pipe Support Design Criteria considers all load types identified in ASME B31.3 and utilizes ASME Section III, Division 1, Subsection NF and Appendix F to supplement the requirements of ASME B31.3 for seismic design of SC-I/II and SC-III/IV pipe supports. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Details of the seismic design methodology are discussed in the Pipe Support Design Criteria document. Analysis is by manual calculation and computer programs that have been tested and approved as discussed in the Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS). The Ancillary Equipment Pipe Support Design document shows examples of typical equipment supports. These are appropriate codes and standards for design of the HFP system ancillary equipment supports. Ancillary equipment supports are to be designed to allow a minimum of heat to be transferred to the building structures (building structures not to exceed 150 °F for concrete and 200 °F for steel). Design standards for vessel internal equipment supports are discussed in the integrity assessment for the HFP system vessels.

Connections	Seams and connections are adequately designed.	24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-DC-PS-01-001, Rev. 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications; ASME/ANSI B16.5, 1988 Edition, Piping Flanges and Flanged Fittings; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The Basis of Design states that in-cell piping that is non-maintainable will be fully welded. The Pipe Stress Design Criteria document specifies the ASME B31.3 Process Piping design code for the piping systems. Welding is to be performed in accordance with the requirements of ASME B31.3 and the ASME B&PV Code, Section IX. Flange connections are to be designed in accordance with ANSI B16.5 as called out by piping material class. These are appropriate codes and standards for design and fabrication of the HFP system ancillary equipment.
Supports	The system will withstand the effects of frost heave.	System Description and SDCNs listed above under References; 24590-WTP-DC-ST-01-001, Rev. 2, Structural Design Criteria	The ancillary equipment associated with the HFP system considered in this assessment is located in above grade process cells inside the HLW Facility. The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line to preclude frost heave. The frost line is 30 in. below grade. The HLW building foundations are not subject to frost heave; therefore, the ancillary equipment located inside the building is not subject to frost heave.

Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature)	24590-WTP-PSAR-ESH-01-002-04, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; HLW Facility Specific Information; System Description, SDCNs, and Process Flow Diagram listed above under References; 24590-WTP-PER-PR-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems.	24590-WTP-PER-PR-03-002 provides discussion of confinement and control methods for the toxic vapor and emission characteristics. The PSAR, a reference to 24590-WTP-PER-PR-03-002, provides a summary of potential hazardous conditions associated with each HLW vessel and the associated ancillary equipment. Design provisions for control of these hazards are listed in the PSAR, the System Descriptions and 24590-WTP-PER-PR-03-002. The HFP System Description identifies the only safety functions for ancillary equipment are to stop all transfers into the vessel at a liquid level set point, providing primary confinement of the wastes during normal operations, upset conditions and during and after a SC-III Design Basis Seismic Event, and providing sufficient agitation to prevent hydrogen accumulation/storage in the waste. Ancillary equipment associated with the Melter Feed Preparation and Melter Feed Vessels (HFP-VSL-00001 and -00002 for Melter 1 and -00005 and -00006 for Melter 2, respectively) handle caustic slurries or vessel ventilation gases. This caustic waste is received, blended with glass forming chemicals and slurry pumped as shown on the Process Flow Diagram. 24590-WTP-PER-PR-03-001 describes approaches to minimizing hydrogen accumulation including application of mechanical agitation of solids, transfer pumps, sparge rings, and ITS power and air for these four vessels. The primary function of the ancillary equipment associated with the HFP System is to provide a primary pressure and fluid boundary to protect facility workers from the hazardous materials in the vessel transfer streams and vessel ventilation stream.

Waste Characteristics	Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents.	24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; System Description and SDCNs listed above under References; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The System Description indicates that the HFP system Melter Feed Preparation and Melter Feed Vessels collect caustic waste and slurries of waste and glass forming chemicals from the concentrate receipt vessels (CRV system) and Glass Former Reagent (GFR) system as well as demister wash-down from the vessel ventilation duct. Additional reagents are not added to this system during normal operations although pumps provide recirculatory sampling capability. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. The HFP vessels and nozzles are fabricated of 316L stainless steel with the exception that the ejector nozzles are specified as Hastelloy C-22. The Piping Material Class Description lists 316L stainless steel as the material selection for the HFP system ancillary equipment. Reagents (other than glass formers) are not normally added to the HFP system ancillary equipment during normal operations.

Compatibility	The pH range of the waste, waste temperature and the corrosion behavior of the structural materials are adequately addressed. Ancillary equipment material and protective coatings ensure the ancillary equipment structure is adequately protected from the corrosive effects of the waste stream and external environments. The protection is sufficient to ensure the equipment will not leak or fail for the design life of the system.	System Description and SDCNs listed above under References; 24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-3PS-NN00-T0001, Rev 0, Engineering Specification for Hot and Anti-Sweat Thermal Insulation	The Basis of Design identifies a service design life of 40 years for the ancillary equipment. All non-maintainable items will be designed to last the life of the facility. Detailed material selection (corrosion) analyses are conducted for each vessel and major components in the melter feed and melter feed preparation system in the HLW facility during process design. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. The Thermal Insulation specification requires that all insulating materials used on the outside of ancillary equipment be pre-approved for use on austenitic stainless steel in accordance with applicable ASTM procedures and tests to preclude external corrosion of ancillary equipment. Corrosion allowances are considered for all ancillary equipment, therefore, the ancillary equipment will provide the expected design service life.

Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the ancillary equipment.	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The Pipe Stress Design Criteria document requires use of the ASME B31.3 Code for ancillary equipment design. Consideration of corrosion, including corrosion allowance, is a mandatory requirement of ASME B31.3. A required service design life of 40 years is identified in the Basis of Design for ancillary equipment located in inaccessible process cells. Detailed material selection (corrosion) analyses are conducted for each vessel and major components in the HFP systems in the HLW Facility during process design. The Materials for Ancillary Equipment document requires that downstream ancillary equipment is to be constructed of equal or better materials than the source vessel, and with the same corrosion allowance as the source vessel except as noted therein. Bounding corrosion allowances are listed for each piping material class in the Piping Material Class Description document and are adequate for the intended service life of the ancillary equipment. The corrosion/erosion allowance for the 316L stainless steel HFP system ancillary equipment is 0.0937 in. for caustic waste transfer lines and 0.040 in. for radar guide tubes and the vessel vent.
Strength	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessels are exceeded.	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The Pipe Stress Design Criteria document specifies use of ASME B31.3 as the design code for the WTP piping. ASME B31.3 requires provision be made to safely contain or relieve any pressure to which the piping may be subjected. ASME B31.3 piping not protected by a pressure relieving device, or that can be isolated from a pressure reliving device must be designed for at least the highest pressure that can be developed. Bounding pressure and temperature limits are listed for each of the piping material classes in the Piping Material Class Description document.

	Maximum flows and any unusual operating stresses are identified	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The expected flow paths for the ancillary equipment are identified on the P&ID drawings. The Pipe Stress Design Criteria document specifies the ASME B31.3 code for piping design. This code requires piping to be designed to the highest pressure that can be developed in a piping system assuring that maximum operating stresses remain within code allowables. The Piping Material Class Description document lists the bounding pressure and temperature limits for each piping material class.
Secondary Containment	Ancillary equipment is designed with secondary containment that is constructed of materials compatible with the waste and of sufficient strength to prevent failure (pressure gradients, waste, climatic conditions, daily operations), provided with a leak-detection system, and designed to drain and remove liquids.	Drawings, System Description and SDCNs listed above under References	The ancillary equipment considered in this assessment is located in above grade melter caves inside the HLW Facility. Secondary containment for ancillary equipment within the cells is provided by the liners and sumps as appropriate and is outside the scope of this integrity assessment.